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EXAMINER	
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ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,974	FUJIOKA ET AL.	
	Examiner	Art Unit	
	DANIEL C. MCCRACKEN	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,8-13,15-28 and 32-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4, 8-13, 15-28, 32-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Response to Arguments

Specification

The objection to the Specification is WITHDRAWN. Applicants amendments to place the Specification in proper idiomatic English will be entered. While Applicants did not state so, upon review, the amendments would not appear to introduce new matter.

Claim Rejections – 35 U.S.C. §112

The rejections are WITHDRAWN in light of Applicants amendment. That said, new rejections appear forthwith to address the amendments.

Claim Rejections – 35 U.S.C. §§ 102-103

Applicants arguments with respect to the art rejections (all one page of them) allege that the prior art fails to teach the void ratio as claimed. Specifically, Applicants state that "the present invention is directed to a void ratio between the fine particles where carbon nanofibers grow. The claims are currently amended to make this distinction clear." Whatever semantic

distinctions have been made, no difference is seen. The prior office action addressed the void ratio (i.e. the space between the catalysts) in numerous rejections, including obviousness rejections where secondary references were provided to cure the primary reference (Resasco) in the event Resasco *might* not have described the void ratio. Applicants have not addressed any of the secondary references applied as required by law. *See* 37 C.F.R. 1.111(b). As such, the Examiner presumes the analysis is correct. New rejections appear *infra* to address Applicants amendments.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 4 and 37 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The terms "calm" and "vigorously" in claims 4 and 37 are relative terms which renders the claim indefinite. The terms are not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-4, 8-11, 13, 15-26, 28, 32-41, and 43-47 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6,413,487 to Resasco, et al. in view of US 5,618,875 to Baker and Ergun, et al., *Fluid Flow through Randomly Packed Columns and Fluidized Beds*, Ind. Eng. Chem. 1949; 41(6): 1179-1184 (hereinafter "Ergun at __").

With respect to Claims 1 and 36, Resasco recites a method of producing carbon nanotubes. *See e.g.* (Resasco 3: 28 *et seq.*). "Fine particles" (i.e. catalysts) are employed, and the nanotubes grow on the catalyst. *See e.g.* (Resasco 4: 15-26). Nanotube recovery, including separation from the catalyst, is taught. *See e.g.* (Resasco 4: 40 *et seq.*).

To the extent Resasco *may* not recite the void ratios claimed *in haec verba*, this does not impart patentability. Resasco makes mention of a fluidized bed reactor. *See e.g.* (Resasco 12: 47-48). Furthermore, Resasco explicitly recites variables that affect the nanotube/nanofiber yield. Resasco states:

> For example, the yield of nanotubes is affected by the catalyst formulation (e.g., transition metal ratio, type of support, and metal loading), *by the operating parameters* (e.g., reaction temperature, catalytic *gas pressure*, *space velocity and reaction time*), and by pretreatment conditions (e.g., reduction and calcination).

(Resasco 3: 59-64) (emphasis added). Thus, there is a very clear, explicit teaching of the result-effective variables in the Resasco process. Void fraction (i.e. the "empty space" in the catalyst bed) is closely intertwined with pressure, space velocity and reaction time. This teaching is

reflected in the literature. *See e.g.* (Ergun at 1182 *et seq.*) (noting the relationship between void volume and flow rate). Optimizing this, especially when Resasco teaches that it effects yield, is well within the level of skill in the art (which as previously noted, was a skilled chemist or chemical engineer).

As to Claims 2 and 37, a "fluidized bed" process – which is being interpreted as the "fluidizing layer" – is taught. (Resasco 12: 47- 13: 42). As to Claim 3, the catalyst is fluidized and carbon nanotubes grow from the catalysts. *Id.* As to Claim 4 notwithstanding the ambiguities noted above, a fluidized bed is taught. *Id.* Whatever "slow" or "vigorous" stirring is being claimed is expected to be taught as Resasco discloses a fluidized bed. As to Claims 8 and 38, silica, alumina and other zeolites are taught. (Resasco 7: 58-62). Note the percent of catalyst to zeolite taught. (Resasco 8: 1-5). As to Claims 9 and 39, any number of separation and recycle steps are taught. *See e.g.* (Resasco "Fig 4," and accompanying text). As to Claims 10 and 40, these claims read on a catalyst on a support, clearly taught by Resasco. (Resasco 7: 52 *et seq.*). As to Claims 11 and 41, any number of metals – including Group VIII (Co, Ni, Pt) are taught. (Resasco 7: 12 *et seq.*). As to Claims 13 and 43, "additive particles" are taught. (Resasco col. 7-8). The zeolites are different shapes than the metal particles. *Id.*

With respect to Claim 19, Resasco teaches reactors with heating means and catalyst recovery separation means. (Resasco "Figures 2-5," 9: 1 *et seq.*). To the extent Resasco may not recite *in haec verba* a "heating apparatus," it is expected to necessarily disclose one. Note that Resasco makes numerous mention of heating steps. *See e.g.* (Resasco 3: 65 *et seq.*, 7: 1 *et seq.*). This is the evidence offered to prove inherency. "[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or

her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)). See above with respect to the void fraction. As to Claim 20, a fluidized bed reactor (i.e. the "fluidizing layer reaction apparatus") is taught. *See e.g.* (Resasco 12: 47 *et seq.*). As to Claim 21, a "catalyst supplying apparatus" is taught. *See e.g.* (Resasco 9: 55 *et seq.*). As to Claim 22, a gas is considered a liquid, and as such, a fluidized bed reactor supplies the catalyst in the presence of a gas, or something in the "liquefied state." *See* (Resasco 3: 65 *et seq.*) As to Claim 23-26, a "catalyst supplying apparatus" is taught. *See Id.* Note that "solid" catalysts are taught. (Resasco 7: 12 *et seq.*). See above with respect to the fluidized bed - as the bed is fluidized, it necessarily has a gas supplying apparatus. *See also* (Resasco "Figs. 2-5").

As to Claim 28, to the extent Resasco *may* not recite *in haec verba* the catalyst (i.e. "fine particle") diameter, it is expected that the diameter is necessarily disclosed. It is well known that the diameter of carbon nanotubes/nanofibers is controlled by the diameter of the catalyst particle. This teaching is reflected in numerous places, for example US 5,618,875 to Baker, et al. *See* (Baker 5: 9-10) ("The catalyst particle size determines the diameter of the filament") Baker, like Resasco, teaches the production of carbon nanofibers. *See* (Baker 3: 10 *et seq.*). Baker also teaches catalyst sizes of 25 Å (= 2.5 nm, *i.e.* within the claimed range). (Baker 5: 8). Therefore, it is expected that the catalysts (i.e. fine particles) as taught in the apparatus of Resasco have the same size as claimed. This is the evidence offered to prove inherency. "[T]he PTO can require an

applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)). As to Claim 32, see discussion of Claim 8 *supra*. As to Claim 33, Resasco recites pressures above 0.01 MPa (Resasco 4: 10-15) and temperatures in the claimed range. (Resasco 7: 1-5). As to Claim 34, Resasco teaches a collision unit. *See e.g.* (Resasco "Fig. 2") *and* (Resasco 9: 1 *et seq*.) Catalysts collide with any of the parts shown or disclosed. Therefore, a "collision unit" is taught. As to Claim 35, heat transfer is described. *Id*.

Claims 15-18 and 44-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco, Rodriguez and Ergun as applied to claims 1 above, and further in view of US 6,645,455 to Margrave, et al.

The preceding discussion of Resasco, Baker and Ergun accompanying the obviousness rejection supra is expressly incorporated herein by reference. With respect to Claims 15-18, notwithstanding the ambiguities noted above, to the extent Resasco may not teach whatever is being claimed, Margrave teaches the compouds claimed. *See* (Margrave 7: 50 *et seq*.). One would be motivated to use such compounds, because they make nanotubes. *See Id*.

Claim 12 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco, Rodriguez and Ergun as applied to claims 1 and 36 above, and further in view of US 6.761,870 to Smalley, et al.

The preceding discussion of Resasco, Baker and Ergun accompanying the obviousness rejection supra is expressly incorporated herein by reference. To the extent Resasco *may* not teach sulfur, this does not impart patentability. Sulfur is a well known catalyst promoter, and the Examiner takes official notice that it is. In support of taking official notices (i.e. in making sure there is substantial evidence on the record), the Examiner provides Smalley. *See e.g.* (Smalley 3: 28 *et seq.*). One would be motivated to use sulfur for any number of reasons, for example promoting the catalytic reaction.

Claim 27 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco, Rodriguez and Ergun as applied to claim 19 above, and further in view of US 5,102,647 to Yamada, et al.

The preceding discussion of Resasco, Baker and Ergun accompanying the obviousness rejection supra is expressly incorporated herein by reference. To the extent Resasco *may* not teach a rotary drum/kiln embodiment, these reactors are old, known, and an obvious expedient. *See e.g.* (Yamada 6: 5 et seq) (describing rotary kilns and fluidized beds).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

All amendments made in response to this Office Action must be accompanied by a pinpoint citation to the Specification (i.e. page and paragraph or line number) to indicate where Applicants are drawing their support.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCRACKEN whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Daniel C. McCracken/
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